Volume 25 Study AFS-51

STATE OF ALASKA
Bill Sheffield, Governor

Annual Performance Report for

STATUS OF SELECTED COHO SALMON STOCKS IN SOUTHEAST ALASKA

By

Artwin E. Schmidt

ALASKA DEPARTMENT OF FISH AND GAME
Don W. Collinsworth
Commissioner

SPORT FISH DIVISION
Richard Logan, Director

Volume 25 Study No. AFS-51-1

RESEARCH PROJECT SEGMENT

State: Alaska Name: Sport Fish Investigations of Alaska

Project No: AFS-51

Segment No.: AFS-51-1 Project Title: A STUDY OF COHO SALMON IN SOUTHEAST ALASKA

Job No.: AFS-51 Segment Title: Status of Selected Coho Salmon Stocks in Southeastern Alaska

Cooperator: Artwin E. Schmidt

Period Covered: July 1, 1983 to June 30, 1984

ABSTRACT

A coho salmon, Oncorhynchus kisutch (Walbaum), research program was begun in 1983 to determine escapement goals, migration routes, run timing, harvest rates, and areas of harvest for selected index streams in southeast Alaska. Coded wire tagging of pre-smolt and smolt populations was conducted at Salmon Lake, near Sitka. Population estimates of these groups were determined. The adult coho escapements to Chilkat Lake, Chilkoot Lake, and Salmon Lake were determined by weir. Escapement surveys were conducted on 31 additional streams throughout southeast Alaska.

Adult escapements to Chilkat and Chilkoot were 1,028 and 1,733 coho, respectively. The escapement to Salmon Lake was estimated to be 403 adult and 397 jack coho. A total of 1,319 coho smolt were tagged between May 9 and June 4 in Salmon Lake. Emigration during this period was estimated to be 2,867 smolt.

A portion of the smolt emigration occurred prior to May 9. A total of 1,491 pre-smolt were coded wire tagged from July 23 to September 29. The population estimate of these fish will be completed during the next smolt emigration.

KEY WORDS

Southeast, Alaska, coho salmon, Oncorhynchus kisutch (Walbaum), escapements, smolt, production, coded wire tagging, weirs, fyke nets.

BACKGROUND

Coho salmon are important to commercial, recreational, and subsistence fisheries in southeast Alaska. From 1977-1981, the commercial

fisheries' harvest averaged 1.3-million coho salmon per year and the recreational anglers' harvest averaged 34,000 coho salmon per year, for a combined value of over $12 million to the fishermen.

In spite of their importance, relatively little is known about the migration routes, run timing, exploitation rates, or escapements of discrete coho salmon populations in southeast Alaska. Logging and mining annually affect over 24,000 acres in drainages producing coho salmon. Additionally, coho salmon are being impacted by expansion of the urban communities.

The Divisions of Sport Fish and Commercial Fisheries have developed a cooperative coho salmon research program. Under this plan, Sport Fish personnel will concentrate their efforts in and near major population centers (Figure 1), while Commercial Fisheries' activities will focus on coho salmon in remote areas.

Table 1 lists the common name, scientific name, and abbreviations of each fish mentioned in this report:

Table 1. List of Common Names, Scientific Names, and Abbreviations.

Common Name	Scientific Name and Author	Abbreviation
Coho salmon	Oncorhynchus kisutch (Walbaum)	SS
Sockeye salmon	Oncorhynchus nerka (Walbaum)	RS

RECOMMENDATIONS

Research

Adult Escapement:

The adult weir should be operated beginning August 10 if the early returning coho are to be caught. The early bright fish which enter fresh water in August are very subject to scale loss and subsequent fungal infection. Some fish which entered Salmon Lake before the weir was installed were later found dead on the weir. These early migrants which get trapped above the weir may not have physiologically adjusted to fresh water. Other researchers have encountered similar mortalities with early returning coho. This phenomenon was very evident at Auke Lake in 1983 (Jerry Taylor, pers. comm. 3/21/84).

These early fish should either be passed upstream with minimal handling or not allowed to pass the weir until they have adapted to fresh water. If passed upstream, these bright fish should have a downstream bypass avenue to return to salt water.

Fin marking of adult fish as a secondary marking during weir operations should be discontinued. This secondary mark promotes fungal infection and is usually not recognizable on the spawning ground. An opercular punch would be a much better mark.

Surveys of the spawning grounds should be started about October 10 and continued through mid-November on a periodic basis to recover spawned fish for tag recovery ratios. Most of the effort should be placed on the main inlet, with secondary effort on the outlet. When adult coho become evident in fair numbers, surveys should be done by skin diving. When diving is begun, tagged to untagged ratios of adults should be determined by capturing spawned fish with an underwater spear. Spawned fish live up to 4 weeks after spawning.

Smolt Tagging and Enumeration:

Emigrant smolt tagging should begin by April 20 to capture the earlier fish. An effort should be made to mark smolt in the lake prior to their emigration. This marking would allow a better estimate of the smolt population and would provide a check on the double fyke net estimates.

Pre-Smolt Tagging:

Pre-smolt tagging should be done in late July and again later in the year. The original tagging should take place over the entire fishable area of the lake so that marks are distributed in all areas. A distributed effort will lead to more comparable data for population estimations. In 1983, it was not possible to estimate populations of the east shore and west shore because of the timing difference in trapping throughout the lake.

Population estimates should be made concurrently with tagging for each area so the changes in estimated population can be evaluated and stabilization of the estimate detected.

OBJECTIVES

1. To enumerate the coho salmon escapements in 12 index streams in the Juneau area, 5 index streams in the Sitka area, 5 index streams in the Ketchikan area, and 6 index streams in the Petersburg area.

2. To determine the immigration route, run timing, harvest rates, and areas of harvest of coho salmon from selected index streams in southeast Alaska.

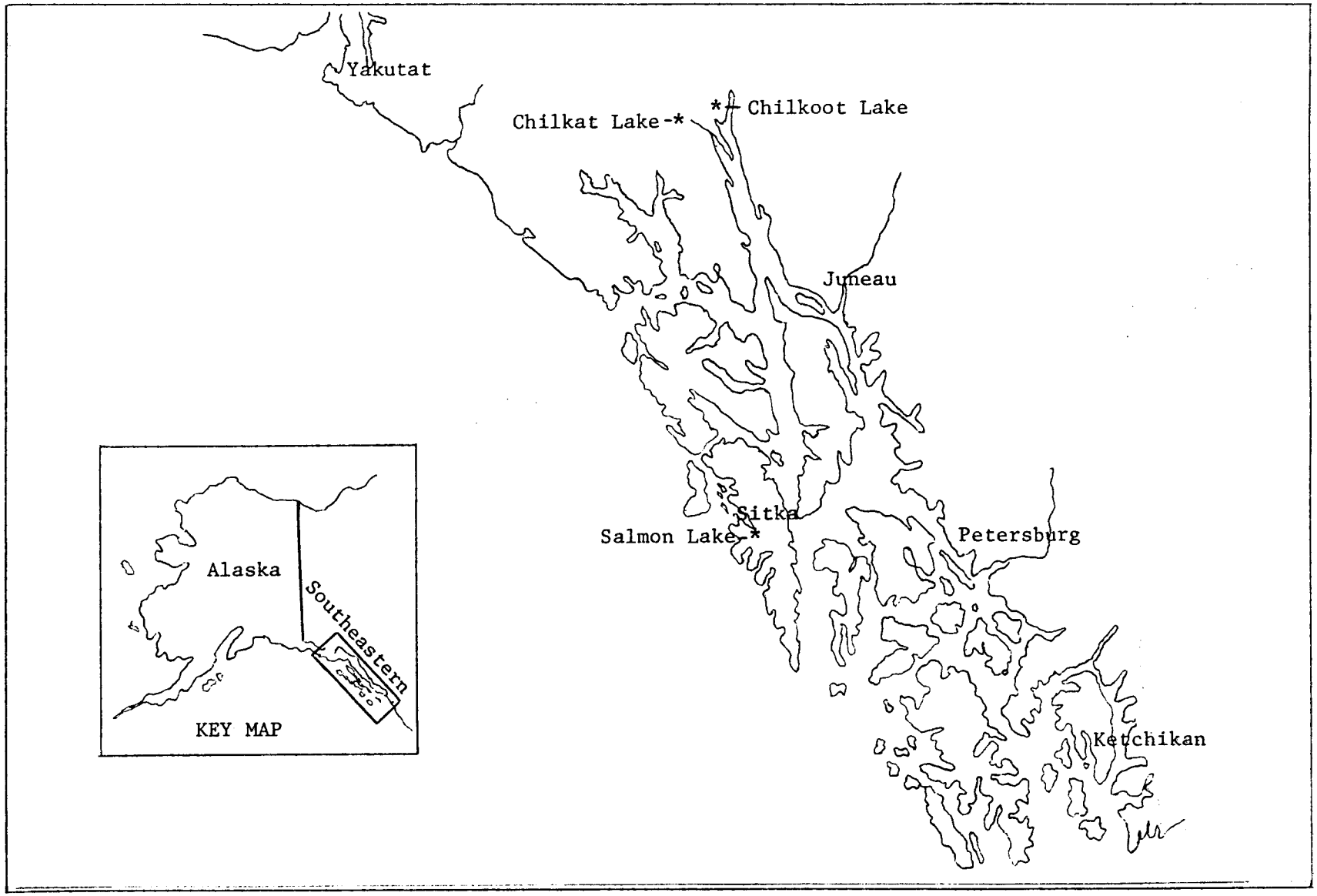

Figure 1. Location of Lakes Studied in Southeast Alaska, 1983.

3. To establish escapement goals for coho salmon in the index streams contributing to urban area recreational fisheries in southeast Alaska.

4. To evaluate habitat disturbances associated with these coho salmon index streams.

Objective 4 was not addressed due to lack of finances and manpower.

TECHNIQUES USED

Adult Escapements

Coho salmon escapement surveys were conducted on selected streams near Juneau, Ketchikan, Petersburg and Sitka. Important coho-producing streams which were small enough to allow reliable foot surveys or weir installation were selected. The streams in each area were surveyed by the Area Management Biologist in that area. An attempt was made to survey each stream more than once to insure enumeration during peak abundance.

Adult coho escapements to the Chilkat and Chilkoot River systems were determined by weir as part of the cooperative agreement by the Division of Commercial Fisheries and the Division of Sport Fish. Data were collected by Commercial Fisheries personnel, with financial support from this program.

Salmon Lake Research

The Salmon Lake watershed (113-41-32) was chosen as the first long-range study site. Two complete life cycles (smolt production to adult return) will provide baseline data needed to calculate escapement goals for systems where this data is available.

During the long-range study, the immigration route, run timing, harvest rates, and areas of harvest will be obtained from coded wire tag recoveries of adults. These tags will be recovered by the ongoing Stock Separation and Creel Census programs, as well as from adult weirs.

Adult Population Analysis:

The Salmon Lake watershed was chosen as a long-range study site. An adult weir was built and operated from August 19 through October 10. The trap portion of the weir consisted of 8-foot by 8-foot sections of aluminum channel and pickets (Figure 2). Full-length (10-foot) pickets were used for the front sides and back of the trap to prevent coho from leaping out. The downstream half of one side of the trap was constructed with 5-foot pickets to facilitate removal of other species by net. Three short sections of channel were placed diagonally across the platform end of the trap with spacers, creating steps onto a channel spanning the width of the trap.

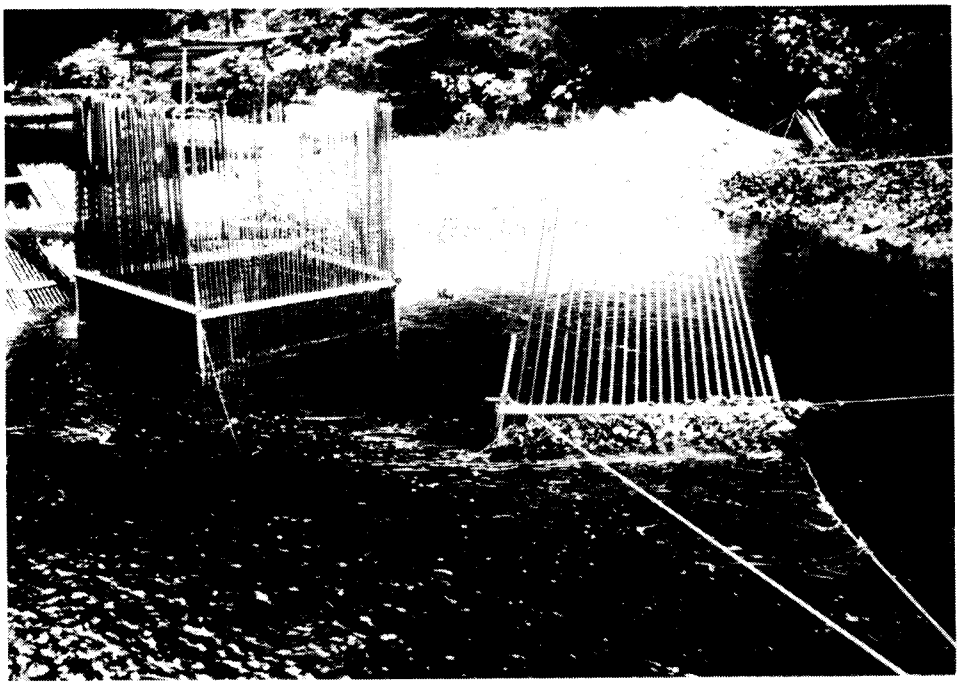

Figure 2. Photo Showing Aluminum Picket Weir With 8-Foot by 8-Foot Holding Trap and Trash Screen.

Use of a long-handled net allowed the weir operator to stand on the channel top to fish the trap without getting into the water. Fishing the trap from above allowed coho to be released into the tank containing tricane methanesulfonate (MS-222) without having to climb out of the trap. This was particularly useful during periods of high water.

A covered platform was constructed between the trap and the weir to allow placement of processing gear. A sheet of plywood was laid across three channels and covered by a plywood roof supported by 10-foot pickets. A standard plastic fish tote was utilized for anesthetizing fish with MS-222. The covered area was useful for keeping forms dry during periods of rain and also served as an equipment storage area. Adult coho processing went as follows: A fresh solution of MS-222 was prepared in the fish tote. A coho was netted and placed into the MS-222. As soon as the fish calmed down, it was measured, floy tagged, a scale sample taken, dorsal punched, weighed, and then placed into a holding pen floating next to the platform. Fish remained in the holding pen until they had recovered enough to jump out of the pen without assistance. This amount of time varied from 15 minutes to overnight, with an average of 1 hour.

Spawning ground surveys were conducted periodically on the inlet to Salmon Lake from September 29 through November 17. Examination of adults in the inlet stream was to determine the ratio of tagged fish which had been passed through the weir to untagged fish which had either gone over the weir or entered the system after the weir was removed. Spawned fish were collected with an underwater spear to allow examination for tag loss. All fish captured were examined for tag loss and spawning condition. If fish were not captured, but only seen under water, an attempt was made to determine if tags were present or lost. If this determination was not possible, these fish were not used in the tagged to untagged ratio. This tagged to untagged ratio was then used to estimate the total escapement.

Smolt Population Investigations:

Emigrant coho smolt were trapped with fyke nets beginning May 9 and continuing until June 6. Fyke nets had 1 m^2 opening, were 3 m long, and tapered to an 11.43-cm inside diameter. Two fyke traps were located upstream from the cabin utilizing a natural lead formed by a log extending into the streambed. Additional leads were constructed from 0.25-inch vexar netting lashed to 4-foot by 8-foot rebar frames (Figure 3). A single fyke trap was placed 150 yards downstream to determine the tagged to untagged ratio of smolt emigrants.

The amount of fishing effort was determined by the number of leads utilized in guiding the smolt to the traps. At times, 95% of the river was blocked by leads when fishing at the highest level of efficiency. Water depth and velocity were the determining factors affecting the number of leads utilized. During periods of extreme high water the traps had to be removed from the streambed to avoid damage to the gear and high mortality rates. A system of pulleys and blocks was constructed to aid in the lifting of traps for cleaning or closure.

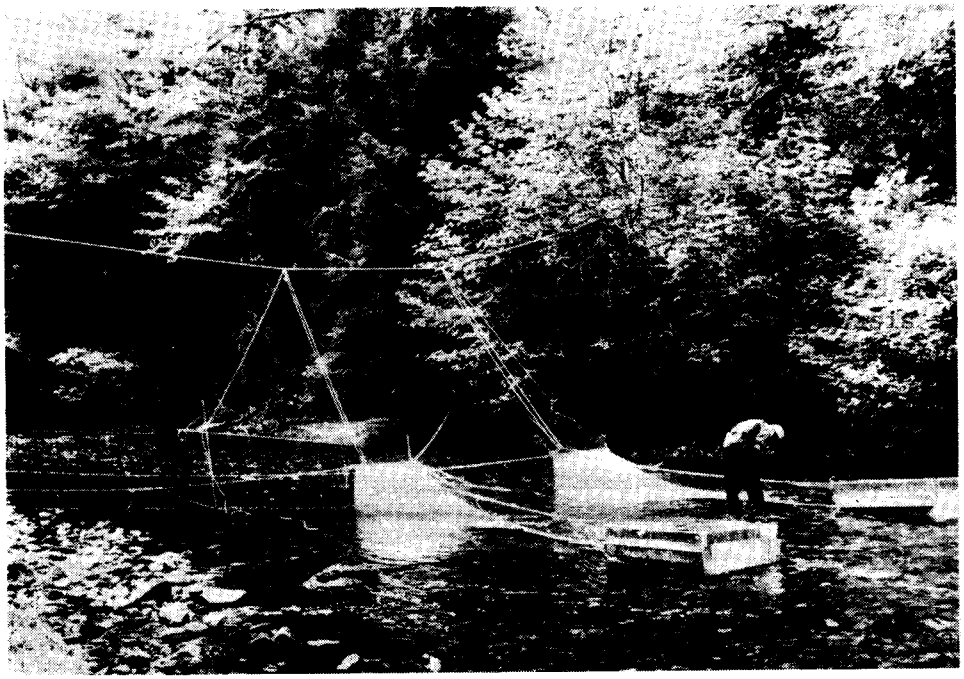

Figure 3. Photo showing Smolt Fyke Nets with Vexar Leads.

Trap boxes were checked every 2 hours through the night to transfer coho smolt to a holding pen. Fyke nets required frequent cleaning due to the amount of drift debris which would accumulate and clog traps and increase smolt mortality. Coho smolt were tagged every other day prior to and after the peak emigration. During the peak of out-migration, coho smolt were tagged every day. Holding pen densities were not allowed to exceed approximately 250 smolt/m3.

The tagging procedure for coho smolt was as follows: Smolt were transferred to the tagging equipment. Smolt were anesthetized, adipose clipped, tagged, placed in a recovery bucket, and released into a holding pen in the river. Tagged smolts were held 6 to 8 hours to insure complete recovery. Smolt were released in the evening to aid in predator-free emigration.

Pre-Smolt Investigation:

Pre-smolt coho salmon were trapped, adipose fin clipped, and coded wire tagged in Salmon Lake intermittently from July 23 to September 29, 1983. Coho distribution was determined by setting traps throughout the lake. Once the distribution of coho was determined, effort was concentrated in the most productive areas. Coho were collected with 41 cm-long commercially available Gee's minnow traps. The traps were baited with salmon eggs and set at selected sites throughout the lake.

Traps were generally suspended from branches or snags and fished from those locations for the duration of tagging within the area. Poles were driven into the bottom for suspending traps in locations where natural supports were not available. Traps were most efficient when suspended off the bottom due to the presence of cottids which would eat the bait and were predacious on the pre-smolt. Stacking three or four traps at 1-m intervals along a line in approximately 5 m of water proved to be an effective means of trapping along the lake shore.

Salmon Lake was divided into four major trapping areas: east shore, west shore, inlet, and outlet.

Traps were usually soaked during the day and pulled during the evening. The coho pre-smolt were placed in a holding pen within the area trapped. Traps were then reset overnight. The following morning the traps were pulled and the pre-smolts were placed in 5-gallon buckets in the boat. The coded wire tagging equipment was set up in the boat prior to pulling the traps to minimize the delay between trapping, tagging and release. Captured fish were anesthetized in a dilute solution of MS-222 before they were measured for length or weight, fin clipped, examined for marks, and tagged. The freshly trapped pre-smolt were tagged and released first. If the number of pre-smolt were in excess of bucket capacity or if the fish began acting stressed, they were placed in the holding pen. Pre- smolts in the pen were then tagged and released. No traps were placed in the immediate holding pen vicinity so the newly released pre-smolt would disperse and not have as great an effect on the recapture data.

The occurrence of trap injuries was noticeable as the 40% recapture ratio was reached. At this point, tagging in the area was suspended until recruitment and/or migration allowed the tagged to untagged ratio to drop.

FINDINGS

Adult Escapement Surveys

Adult coho escapement indexes were determined for 31 stream systems in southeast Alaska. Summary information is presented in Table 2. All records are included in the Department of Fish and Game computerized "Salmon Escapement Stream Surveys."

Chilkat and Chilkoot Weir Escapements

Coho passed the Chilkat weir beginning September 9 and continued until November 12, when the weir was removed (Table 3). During this period, 1,028 adult coho were passed through the weir. There may have still been a significant number of fish holding below the weir on the Chilkat and Tsuhu Rivers when this weir was pulled. It was evident that the weir did not stop jack coho, as there was excellent sport fishing for jack coho in the lake.

The first coho passed the Chilkoot weir on September 8 and the last coho were counted through on November 11 (Table 3). When the weir was removed on November 13, only four fish were observed downstream of the weir. During this period 1,733 fish had passed through the weir. The Chilkoot system appears to be an excellent index system to represent the upper Lynn Canal area.

Salmon Lake Research

Adult Population Analysis:

The weir was installed and operational on August 19 and began trapping coho immediately. Figure 4 demonstrates the daily weir passage of adult and jack coho, along with the water level in the river. A total of 218 adult coho and 113 jack coho were passed through the weir from August 19 to October 10, 1983. Local fishermen reportedly caught bright coho in Salmon Lake the week before the weir was operational. Redoubt Lake, the drainage south of Salmon Lake, has had an adult weir operated by F.R.E.D. Division during parts of the last 2 years. Weir records show that Redoubt coho begin entering by mid-July, with significant numbers of coho entering Redoubt Lake about August 10.

The water level at the weir was high enough on September 4 (126 mm) and 24 (127 mm) so that fish escaped over and around the weir. These dates were during peaks in the coho migration, so large numbers of fish probably bypassed the weir.

Table 2. Summary of Adult Coho Escapement Surveys Conducted by Sport Fish Division in Southeast Alaska.

Area/System	Stream Number	Escapement 1983 Number	Escapement 1983 Date	Previous Counts High/Year	Previous Counts Average
Juneau					
Salmon Creek	111-40-015	2	10/15	12/1981	6
Peterson Creek	111-50-075	95	10/17	95/1983	39
Switzer Creek	111-40-007	80	10/26	109/1981	90
Johnson Creek	111-50-065	9	10/21	19/1982	12
Montana Creek	111-50-052	636	10/10	636/1983	469
Cowee Creek*	111-20-062	25	10/13	113/1982	46
Jordan Creek	111-50-062	184	10/22	482/1981	345
Duck Creek	111-50-060	13	11/08	No Previous Data	
Vanderbilt Creek	111-40-042	11	11/15	33/1982	18
Steep Creek	111-50-056	171	10/31	515/1981	305
Mendenhall Ponds	111-50-050	16	10/19	83/1982	50
Windfall Lake	111-50-006	28	11/01	235/1982	132
Fish Creek	111-50-069	7	11/03	7/1983	3
Lemon Creek	111-40-010	11	10/28	15/1982	9
Peterson Creek	111-50-010	219	10/06	320/1982	241
Ketchikan					
White River	101-45-024	316	10/14	No Previous Data	
Ward Creek**	101-45-024	565	11/01	81/1982	53
Indian Creek	101-71-004	1,263	11/03	1,500/1979	1,253
Carroll River	101-45-078	524	11/08	No Previous Data	
Hulakon River	101-75-015	380	11/22	No Previous Data	
Naha River*	101-90-050	198	11/30	No Previous Data	
Petersburg					
Sumner Creek***	108-40-040	48	10/05	No Previous Data	
Ohmer Creek***	108-40-050	159	10/06	160/1982	160
Bear Creek	108-50-003	63	10/11	216/1977	105
Falls Creek	106-44-006	225	10/10	1,950/1955	450
Petersburg Creek	106-44-060	324	10/13	7,000/1940	645

Table 2 (con't.). Summary of Adult Coho Escapement Surveys Conducted by Sport Fish Division in Southeast Alaska.

Area/System	Stream Number	Escapement 1983 Number	1983 Date	Previous Counts High/Year	Previous Counts Average
Sitka****					
Deep Bay Creek	113-64-001	52	10/14	500/1964	214
Sinitsin Creek	113-62-008	31	9/27	85/1981	57
St. John's Creek	113-66-006	12	10/13	51/1981	38
Nakwasina River	113-43-002	217	10/14	780/1981	383
Indian River	113-41-019	55	11/03	161/1982	86
Starrigavan	113-41-015	45	10/06	317/1982	244

* This system cannot be adequately surveyed by foot or air.
** Increased escapements from hatchery production.
*** These systems will be receiving hatchery fish so will no longer be used as index streams.
**** All surveys in the Sitka Area were a cooperative effort with the Commercial Fish staff.

Table 3. Daily Adult Coho Escapements at Chilkat and Chilkoot Weirs, September 8-November 13, 1983.

Date		Chilkat	Chilkoot	Date		Chilkat	Chilkoot
September	8	0	8	October	12	33	38
	9	7	5		13	2	41
	10	0	12		14	0	59
	11	12	8		15	0	21
	12	3	6		16	1	22
	13	8	22		17	4	14
	14	6	15		18	0	10
	15	6	8		19	83	67
	16	2	8		20	0	30
	17	4	7		21	103	34
	18	1	25		22	0	44
	19	31	51		23	0	10
	20	33	28		24	31	1
	21	0	32		25	0	48
	22	1	11		26	0	9
	23	1	30		27	6	10
	24	1	19		28	32	51
	25	4	6		29	118	50
	26	8	15		30	34	6
	27	11	18		31	38	24
	28	0	25				
	29	5	31	November	1	0	2
	30	18	15		2	0	2
					3	5	8
October	1	52	32		4	23	61
	2	36	4		5	4	82
	3	45	36		6	2	13
	4	45	60		7	0	5
	5	59	84		8	0	0
	6	0	124		9	0	0
	7	3	36		10	0	0
	8	57	71		11	5	9
	9	4	30		12	15*	0
	10	6	5		13	...	0*
	11	20	71				
				Totals		1,028	1,729

*Weir pulled this date.

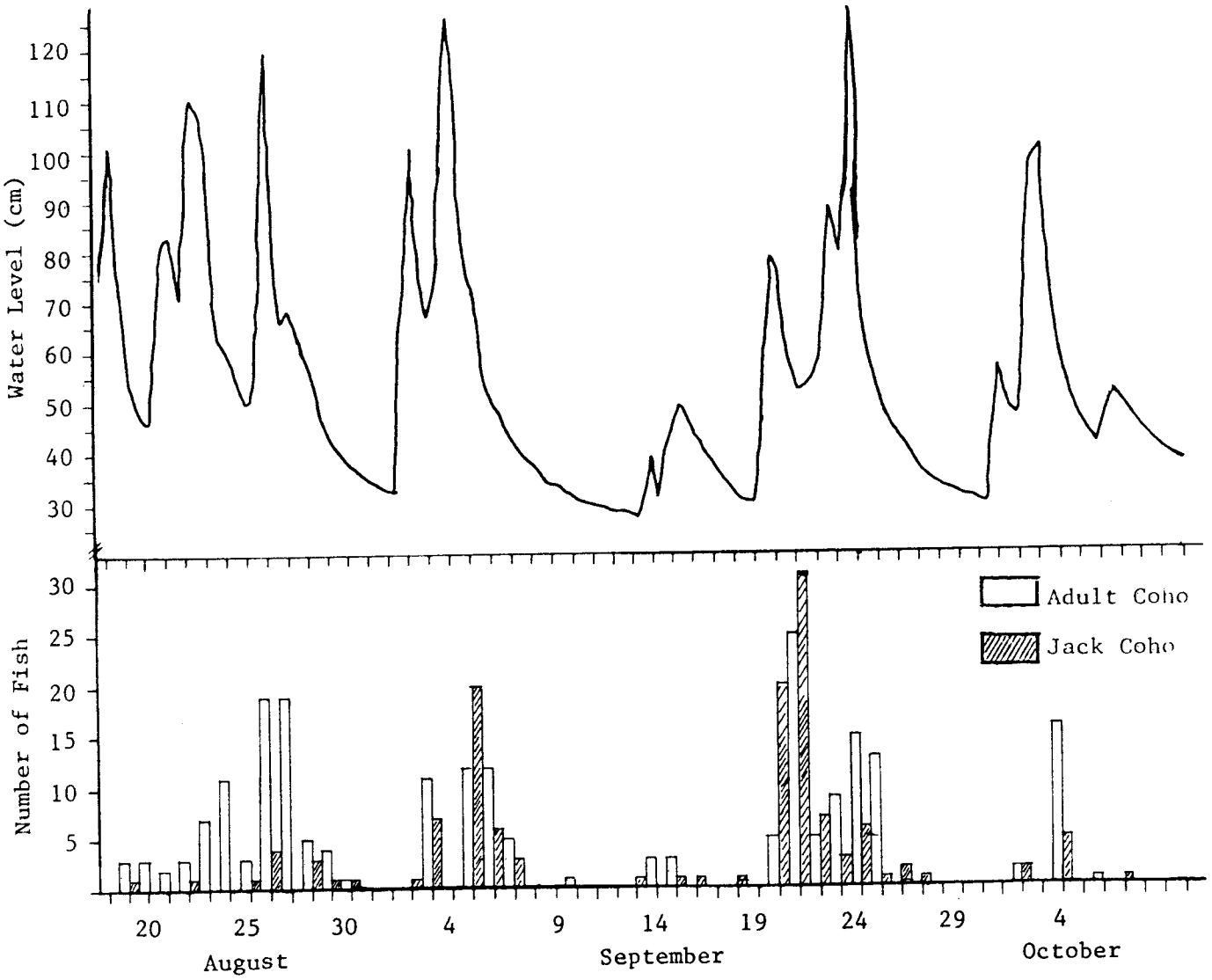

Figure 4. Coho Emigration as Correlated With Water Level, Salmon Lake Weir, 1983.

Special problems were encountered during periods of high water which led to higher mortality rates. High water velocity within the trap caused exhaustion and injury to the fish. A screen was installed approximately 8 feet upstream of the weir to deflect the current and collect debris which would otherwise end up on the face of the trap (Figure 2). The screen consisted of two 8-foot channels separated by spacers angled 45o to the current with 10-foot pickets placed in every other hole. Anchoring the device successfully was difficult because of the tremendous strain incurred during flooding. It was necessary to run anchor lines to trees onshore as well as having riverbed anchors. The screen was very effective and reduced the trap water velocity to a point where the trap could be fished easily at all but the most severe water levels. An eddy was created between the screen and the trap, which newly released fish utilized as holding water until they were back to full strength after processing.

Another problem that occurred during high water was the incidence of coho that would hang themselves between the pickets in their effort to jump through the weir. The midpoint of the pickets between the top two channels contained sufficient play to allow adult coho to jam their head through to the opercular covers. They were held this way until they expired. Eight coho died in this manner during three high-water periods. When water was above the second channel, leaves were allowed to accumulate on the face of the weir. This pressure on the pickets prevented the fish from separating them and being caught. Drains were created in the debris near the tripod legs to reduce pressure on the weir. When the water level dropped below the halfway point between channels, fish would begin jumping at the pickets as the damming action created suitable holding water below the weir. The weir face was then cleared of debris which caused the coho to resume their holding position behind the trap opening. Placing an additional channel between the top two would prevent this hazard.

Increasing upstream migration resulted in increasing occurrence of trap mortalities, i.e. split heads and punctured eyes, which prompted the closure of the trap at night from 2100-0500 hours. The closure allowed closer monitoring of the trap. Fish that were holding below the weir in the early morning readily moved into the trap when it was opened. During lower water levels, it was necessary to stay off the weir for several hours at a time because the fish would spook away from the trap.

A total of 21 coho, including five jacks, tagged at the weir washed up dead or dying prior to spawning. Information from these tagged coho, which were recovered dead, is summarized in Table 4. Several of these fish had commercial hook injuries or weir injuries when they were tagged and died from subsequent infection. These injured fish should be passed upstream without tagging and with a minimum of handling. Fish which are very bright when tagged are very subject to scale loss and fungal infection. These bright fish appear weak after high-water migration and are apparently more subject to stress. No tagging should be done during extremely high water periods as capture and handling conditions are marginal. All nets used to handle fish must have soft, flat-mesh, knotless webbing.

Table 4. Summary of Tagged Coho Mortalities Which Died Prior to Spawning, Salmon Lake Weir, 1983.

Tag Number	Sex	Date Tagged	Date Recovered	Days Free	Comments
2	F	8/19	8/22	3	Heavy infestation of roundworms
11	F	8/22	8/22	0	Never recovered from MS-222
24	F	8/24	8/25	1	Commercial hook broke off in throat
5	M	8/20	8/25	5	Injured before tagging
38	F	8/26	8/27	1	High scale loss - handling during high water
42	jack	8/26	8/27	1	High scale loss - handling during high water
64	F	8/27	8/29	2	Very weak when tagged - high water
40	M	8/26	9/02	7	Tagged during high water
93	F	9/03	9/04	1	Hook injury before tagging
7	F	8/21	9/06	15	
139	F	9/06	9/09	3	Injured before tagging
117	jack	9/05	9/10	5	60% scale loss
131	F	9/06	9/11	5	
97	jack	9/03	9/12	8	
130	F	9/06	9/14	8	Heavy fungus
120	jack	9/05	9/14	9	Injured before tagging
108	F	9/05	9/20	15	Tagged during high water
183	M	9/21	9/21	0	
267	F	9/24	10/2	9	Bright when tagged
143	F	9/06	10/3	27	
232	F	9/21	10/9	19	

Untagged coho began washing up on the weir beginning October 1, when an unspawned, untagged female washed onto the weir from upstream. An unspawned, untagged male carcass washed onto the weir on October 4.

Spawning ground surveys of the inlet on September 29 and October 5 and 7 resulted in one tagged female being seen on October 5. A single spawned female carcass washed up on the weir on October 4.

On November 1, the first dive survey conducted on the lower half mile of the main inlet showed that a number of fish had spawned or were spawn- ing. Five carcasses were also found with evidence of other predation. During this survey, it was not possible to collect spawned fish because no spear was available.

A fish collection effort was conducted on the main inlet to Salmon Lake on November 7. The stream was surveyed downstream from the point where the trail crosses the main inlet about 1.25 miles above the lake. No fish were found in the upper quarter mile of stream or the lower quarter mile of stream. Water temperature of the inlet stream was 4.0C. A similar fish collection effort was conducted on the 0.7-mile outlet stream from Salmon Lake to tidewater on November 8. The tempera- ture of the outlet stream was 5°C.

Thirty-seven adult coho and 19 jack coho were observed in the inlet and outlet from Salmon Lake on November 7 and 8, 1983. Close examination was made of 22 adults and 14 jack coho. Only 45% of the adults (10 of 22) and 21% of the jacks (3 of 14) had been tagged at the weir. This tagged/untagged ratio can be applied to expand weir data to total escapement for Salmon Lake. The adjusted Peterson estimate yields a point estimate of 403 adult and 397 jack coho to Salmon Lake.

A dive survey of the inlet and upper outlet on November 17 showed that no more spawning fish had entered the system. Two spent female fish were recovered; one was a "no tag" and one a "tag loss". Eight spent coho were seen in the upper outlet stream between the lake and the weir site.

Tag recovery information indicates that adult coho spawn about 6 weeks after entering the weir, but live up to 10 weeks in fresh water after passing through the weir. Only one female, examined on November 7, had not begun spawning. The others were spawned completely, except for one which was 50% spawned. Female No. 058, found dead, spawned on the spawning area on November 7, had gone through the weir August 27. Female No. 060, spawned but alive at the weir site, also entered August 27. Female No. 191, which had not begun to spawn but was ripe, entered the weir September 21. Female No. 283, which entered the weir September 25, was about 50% spawned. Floy tags numbered 094 (female), 118 (male), 136 (female), and 304 (female) were found on the creek bed from fish which entered the weir September 3, September 5, September 6, and October 4, respectively.

Tag retention of the Floy anchor tags used at the weir was 60%.

The jack coho salmon, which returned through the adult weir during August through October, were examined for adipose clips and coded wire tags. No tags were found out of 113 jacks examined. Perhaps the jacks were from the earlier smolt which migrated prior to our fyke netting and tagging.

Smolt Population Investigations:

A total of 1,319 coho smolt were tagged during the May 9 to June 6 period. Nearly all were caught during the first 9 days of trapping. Total smolt emigration during the study period was 2,867 based on the 46% marked ratio of smolt in the lower fyke nets.

Coho smolt were captured the first night the traps were in place (Table 5), and emigration peaked only 5 days after trapping was begun. A significant portion of the migration probably occurred prior to our trapping effort. The coho smolt emigration at nearby Redoubt Lake was about half over when the fyke nets were first fished in Salmon Lake. Figure 5 shows the length-frequency of coho smolt which ranged from 80 to 152 mm. Mean condition factor of smolt was 0.94, with a standard deviation of 0.10.

Daily coho smolt emigration was greatest from 1800 to 0200 hours. The fyke nets were fished all day, until after the peak of coho emigration, then pulled in the early morning and reset in early afternoon for the remainder of the period. This fishing pattern targeted effort on coho smolt and reduced stress on the fragile sockeye smolt which moved at all hours of the day and night.

Sockeye smolt were captured in the fyke nets throughout the study period. Length-frequency data from these smolt are presented in Figure 6. Age analysis of sockeye smolt scales showed all smolt 70 mm to be age 1 and 70 to be age 2. Mean length of all sockeye smolt measured was 78.5 mm.

Pre-Smolt Investigations:

A total of 1,491 pre-smolt were coded wire tagged from July 23 to September 29. Tag retention was 96.65% on 477 pre-smolt recaptured during ongoing tagging operations. Based on this retention value, the total number of tagged pre-smolt should be 1,457. Fyke net trapping in spring 1984 will again estimate this population for overwinter survival.

A Schnabel estimate of population size was calculated for pre-smolt coho in Salmon Lake. The final point estimate was 2,493 fish, with a 95% confidence interval ranging from 2,279 to 2,727.

The inlet littoral area with emergent vegetation was the preferred coho habitat and accounted for approximately half (1,232) of the estimated population. A small area of emergent vegetation near the outlet provided habitat for approximately one-third (752) of the pre-smolt coho. The remainder of the pre-smolt were near shore around the remainder of the lake. The west shore had a larger population of

Table 5. Summary of Downstream Smolt Catch at Fyke Net Capture Station, Salmon Lake, 1983.

Date	Water Temp. °C	Stream Depth (cm)	Coho Smolt	Sockeye Smolt
May 10	7.0	. . .	72	9
11	7.0	. . .	115	13
12	7.0	. . .	*	*
13	7.0	41.0	233	39
14	7.0	42.5	*	*
15	6.5	41.0	615	36
16	7.0	38.0	*	137
17	7.0	53.5	205	268
18	7.0	62.0	*	*
19	5.5	119.0	68	114
20**	6.0	85.0	. . .	. . .
21***	6.0	71.0	0	28
22****	6.0	72.0	0	39
23	. . .	62.5	*	*
24	6.0	51.0	2	147
25	. . .	69.0	8	73
26	. . .	63.0	0	40
27	6.8	55.0	0	42
28	6.5	58.8	0	37
29	7.0	55.5	2	151
30*****	7.0	58.0	. . .	. . .
31	7.0	47.0	. . .	. . .
June 1	7.0	43.0	. . .	. . .
2******	8.0	40.0	0	0
3	. . .	40.0	0	12
4	. . .	39.0	0	21
5	. . .	38.0	0	11

* Information for coho and sockeye salmon included in next day's catch figures.

** Traps were pulled May 19 at 1600 hours due to high water. Traps were reset May 21 at 1100 hours.

*** On May 21 traps were fished without vexar leads.

**** On May 22 traps were pulled at 1445 due to rising water; reset May 23 at 0830.

***** Traps were pulled May 30 due to lack of smolt recapture.

****** On June 2 a decision was made to reinstall traps to determine the extent of sockeye salmon out-migration.

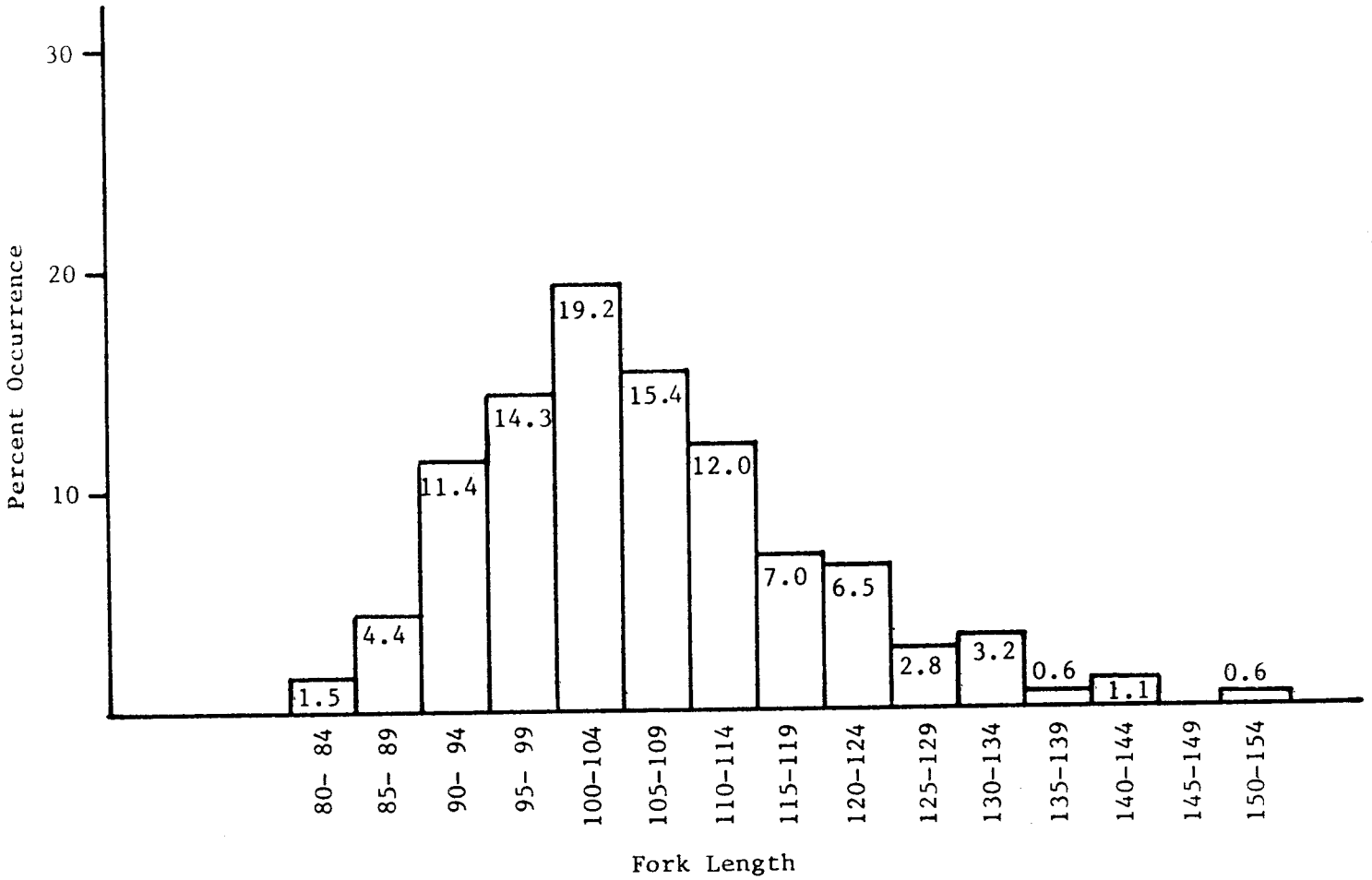

Figure 5. Relative Length-Frequency (Percent Occurrence) of 616 Coho Smolt by 5-mm Size Class, Salmon Lake Creek, May 11-19, 1983.

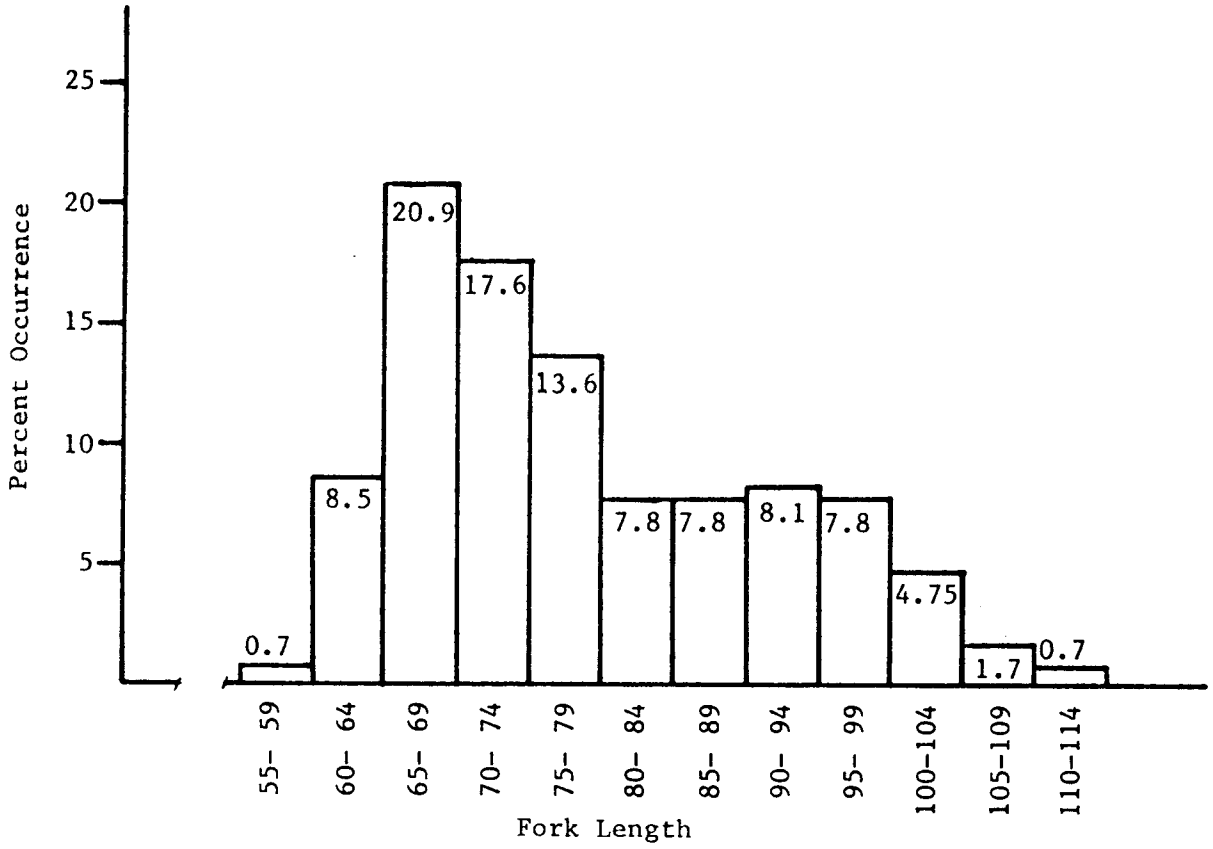

Figure 6. Relative Length-Frequency (Percent Occurrence) of 295 Sockeye Smolt by 5-mm Size Class, Salmon Lake, May 24-27, 1983.

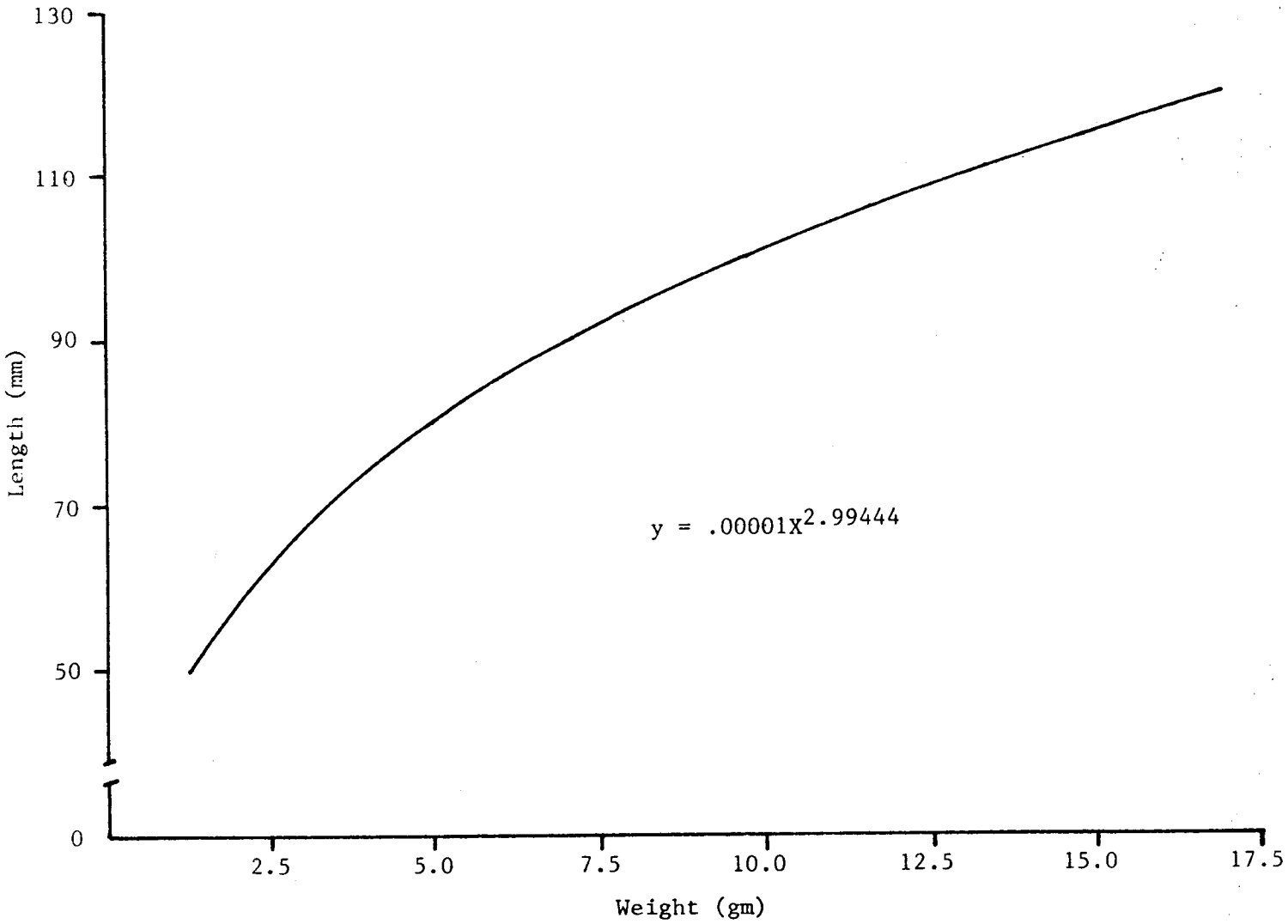

Figure 7. Length-Weight of Coho Pre-Smolt, Salmon Lake, August 13, 1983.

pre-smolt than did the east side. Fry of the year and rearing coho 80-mm in length tended to congregate along the east shore. An attempt to capture coho in open water by fishing strings of fry traps suspended from the surface was unsuccessful.

A length-weight regression of 152 rearing coho was calculated and presented in Figure 7. The condition factor of these coho was 0.98, with a standard deviation of 0.09.

Prepared by:

Artwin E. Schmidt
Fishery Biologist

Robert E. Johnson
Fish Technician

Approved by:

E. Richard Logan, Ph.D., Director
Division of Sport Fish

Louis S. Bandirola, Deputy Director
Division of Sport Fish